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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	:	
Jeffrey A. Lee	:	Group Art Unit: 1731
U.S. Serial No.: 09/793,874	:	Examiner: M.S. Alvo
Filing Date: February 27, 2001	:	
Docket No. 2159 (FJ-99-39)	:	
For: METHOD OF BLEACHING AND PROVIDING PAPERMAKING FIBERS WITH DURABLE CURL	:	

Assistant Commissioner for Patents
Washington, D.C. 20231

DECLARATION UNDER 37 CFR 1.132

Jeffrey A. Lee, inventor of the subject matter of the above-noted patent application hereby declares that:

1. He was awarded a Bachelor of Science degree from the University of Wisconsin in Green Bay, Wisconsin and has worked in the field of paper manufacture since 1989. That he believes himself the sole inventor of the subject matter of the above-noted patent application, which is generally directed to a method of curling and bleaching fiber.

2. That he has read the Official Action of January 31, 2002 rejecting Claims 1-63 as well as the references referred to in making those rejections and that he is familiar

with United States Patent No. 5,772,845 to *Farrington et al.* and United States Patent No. 5,501,768 to *Hermans et al.*

3. That he makes this *Declaration* on personal knowledge of the facts stated herein.

4. That mechanical pulps, or other high yield pulps are generally high lignin content pulps as noted in the '845 *Farrington et al.* patent at Cols. 5 and 6:

> Interestingly, it is believed that the degree and permanency of the curl is greatly impacted by the amount of lignin in the fibers being subjected to the disperging process, with greater effects being attainable for fibers having higher lignin content. Hence high yield pulps having a high lignin content are particularly advantageous in that fibers previously considered not suitably soft can be transformed into suitably soft fibers. Such high yield pulps, listed in decreasing order of lignin content, are groundwood, thermomechanical pulp (TMP), chemimechanical pulp (CMP), and bleached chemithermomechanical pulp (BCTMP). These pulps have lignin contents of about 15 percent or greater, whereas chemical pulps (kraft and sulfite) are low yield pulps having a lignin content of about 5 percent or less.

5. That the above passage of the *Farrington et al.* '845 patent notes that lignin-rich fibers are preferred in the curling process described in the '845 patent (which does not relate to bleaching). This observation is consistent with Untied States Patent No. 4,431,479 to *Barbe et al.* where claims are directed to a process for heat-setting curled high yield or lignin-rich fiber. The following passage (Col. 5, line 44 and following) is representative of the process of the '479 *Barbe et al. patent*:

> Among the advantages of the method of aspects of this invention in setting in fibre curl in high-yield pulps and mechanical pulps is to provide a means of controlling pulp properties in order to impart high wet-web stretch, work-to-rupture and increased drainage rates. In the case of high-yield pulps, in addition to the above wet-web properties, higher dry-sheet tear strength and stretch are also obtained.

> Thus, by this invention, it has been discovered that when lignocellulosic pulp fibres, that have already been made curly, are heat treated at (a) consistencies from 10% to 35%, (b) temperatures from 100°C. to 170°C. using steam at corresponding pressures of 5 psig to 105 psig, (c) for a period of time of from 2 minutes to 60 minutes, fibre curl permanently sets in place, and the curl is made resistant to removal in subsequent mechanical action experienced by fibres in the papermaking process. The method of aspects of this invention improves drainage, wet-web stretch, wet-web work-to-rupture and dry-sheet tear strength and stretch.

6. That United States Patent No. 5,501,768 to *Hermans et al.* teaches that a disk refiner is not a preferred method of imparting curl to fiber, as is noted at Col. 3, line 54 and following:

> In working the fibers within the disperser, such as by shearing and compression, it is necessary that the fibers experience substantial fiber-to-fiber contact by rubbing or shearing in addition to rubbing or shearing contact with the surfaces of the mechanical devices used to treat the fibers. Some compression, which means pressing the fibers into themselves, is also desirable to enhance or magnify the effect of the rubbing or shearing of the fibers. The desired fiber-to-fiber contact can in part be characterized by apparatus having a relatively high volume-to-working surface area ratio which increases the likelihood of fiber-to-fiber contact. The working surface for purposes herein is defined as that surface of the apparatus which contacts the majority of the fibers passing through. For example, disc refiners have a very low volume-to-working surface area (approximately 0.05 centimeters) because there is relatively small volume or space between the opposed rotating discs (working surfaces). Such devices work the fibers primarily by contact between the working surfaces and the fibres. However, the apparatus particularly useful for purposes of this invention, such as the various types of shaft dispersers, have a much higher volume-to-working surface area. Such volume-to-working surface area ratios can be about 1 centimeter or greater, preferably about 3 centimeters or greater, and more specifically from about 5 to about 10 centimeters. These ratios are orders of magnitude greater than those of disc refiners.

7. That, contrary the above teachings of *Barbe et al.*, *Farrington et al.* and *Hermans et al.*, it was unexpectedly discovered that low-lignin content fiber such as recycle or Kraft fiber could be provided with a very durable curl during bleaching in a disk refiner at short residence times and low power inputs. The Examples of the invention of the above-noted patent application illustrate these features of the process of the invention.

8. That Examples 1-8 and 9-25 of the above-noted application utilized secondary or recycle pulp. The pulp of Examples 1-8 was a lower brightness pulp containing a mix of chemical pulps, some amount of unbleached chemical (Kraft) pulp, and probably some amount of groundwood, or lignin containing fibers. Pulp of Examples 9-25 was higher brightness pulp which likely had a lower lignin content (less groundwood contamination) than that of Examples 1-8. That based on his experience, he would estimate that the Examples 1-8 pulp likely contained 10-15% groundwood fiber while the pulp used in Examples 9-25 had perhaps 5-10% groundwood fiber versus the 100% groundwood fiber in a pure mechanical pulp. These secondary pulps were amendable to curling by the process of the invention as is seen Tables 2 and 4, where 100% increases in curl index are typical. One possible conclusion here is that some level of groundwood contamination does not interfere with the curling/bleaching process of the invention. It is seen from Examples 26-31 that the higher lignin pulps did not curl well.

9. That Examples 26-29 of the above-noted patent application employed Western Aspen (Millar Western Aspen APP/BCTMP) which is aspen derived alkaline peroxide pulp/bleached chemithermal mechanical pulp, a high lignin, hardwood pulp. This pulp contains more than about 15% lignin; however, did not curl as well as other fibers curled in accordance with the present invention. It can be seen from Table 5 of the application as filed (attached hereto), first few rows, on average the fiber did not curl nearly as much as the low-lignin fiber in Tables 2 and 4. For example, the

"Base" or untreated fiber had a length weighted curl index of about 0.044 and the average curl for the seven samples is less than 0.06 or less than a 50% increase in curl.

10. That Examples 30 and 31 of the above-noted patent application utilized softwood and hardwood alkaline peroxide mechanical pulp (APMP), respectively. That these pulps are likewise high lignin pulps, having a lignin content of more than 15%. The control (untreated) softwood APMP fiber exhibited a curl index of 0.157, whereas Example 30 exhibited a lesser curl index value showing a decrease in curl. Likewise, the hardwood APMP of Example 31 showed a decrease in curl over the control.

11. That Examples 32-35 of the above-noted patent application utilized low-lignin Kraft hardwood and softwood fibers. These fibers have a lignin content of less than 5%. It can be seen in Table 5, second to last column that, here again, the treated fibers exhibited a curl index increase of 100% and more over control Examples G and H, which were the respective untreated pulps. This percent increase was consistent with that observed in connection with the recycle fiber of Examples 1-8 and 9-25.

12. That, based on the disclosure of the prior art discussed above, the results of Tables 2, 4 and 5 are unexpected and that lignin content is not required for the process of the present invention to be effective in providing a durable curl to papermaking fiber. The results of the present invention are also contrary to the teachings of the *Hermans et al.* patent discussed above which indicates that a disk refiner is not an effective curling apparatus. It was discovered that at elevated temperatures and pressures, a disk refiner can be a very effective apparatus for curling fiber.

13. The undersigned Declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge

that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the subject application or any patent issuing thereon.

Dated April 29, 2002

J A Lee

Jeffrey A. Lee

Table 5. Examples 26-35 Pulp Fiber Analysis Data

		Percent Fines		Mean Length mm			Mean Curl		
Example	Ret	Arithmetic	Length Weighted	Arithmetic	Length Weighted	Weight Weighted	Arithmetic	Length Weighted	Kink Index
Base		39.4	10.74	0.422	0.694	0.893	0.042	0.044	0.76
26	0	41.88	12.39	0.395	0.648	0.827	0.076	0.079	1.17
26	12	42.7	12.56	0.39	0.66	0.88	0.073	0.078	1.14
27	0	39.8	11.08	0.417	0.683	0.866	0.038	0.039	0.55
27	12	39.8	10.74	0.421	0.688	0.861	0.038	0.039	0.53
28	0	39.52	10.46	0.439	0.722	0.925	0.035	0.036	0.5
28	12	41.17	11.26	0.418	0.693	0.875	0.037	0.037	0.52
29	0	45.15	14.53	0.36	0.617	0.837	0.082	0.084	1.31
F		52.27	9.36	0.6	1.751	2.633	0.122	0.157	1.33
30	0	54.09	9.28	0.623	1.913	2.86	0.089	0.103	1.03
30	72	53.83	8.89	0.651	2	2.915	0.077	0.094	0.98
F		55.9	16.24	0.377	0.794	1.087	0.109	0.121	1.67
31	0	55.08	15.46	0.385	0.817	1.152	0.083	0.089	1.48
31	72	55.27	16.05	0.373	0.786	1.087	0.065	0.071	1.17
G		56.42	7.33	0.798	2.399	3.238	0.087	0.097	1.27
32	0	58.12	8.46	0.717	2.293	3.18	0.197	0.211	2.4
32	72	51.04	6.2	0.859	2.395	3.216	0.19	0.209	2.33
33	0	55.92	7.59	0.749	2.283	3.134	0.192	0.202	2.42
33	72	53.65	7.12	0.78	2.259	3.056	0.192	0.209	2.31
33	3	55.77	7.98	0.748	2.304	3.228	0.213	0.233	2.42
33	3	56.16	7.68	0.744	2.319	3.198	0.201	0.215	2.42
33	72	55.4	7.92	0.738	2.238	3.089	0.205	0.225	2.32
33	72	54.4	7.42	0.772	2.265	3.114	0.199	0.214	2.32
H		63.73	16.29	0.379	0.935	1.32	0.082	0.091	1.4
34	0	61.73	17.16	0.365	0.835	1.131	0.159	0.169	2.21
34	12	60.12	15.82	0.383	0.873	1.172	0.145	0.154	2.15
35	0	57.65	14.5	0.408	0.893	1.195	0.141	0.153	2.07
35	12	59.73	15.34	0.398	0.892	1.181	0.127	0.139	1.99